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Conservation Plan for Colorado River Cutthroat Trout in Northwest Colorado

CONSERVATION PLAN FOR COLORADO RIVER CUTTHROAT TROUT IN NORTHWEST COLORADO

"TO PRESERVE EXISTING POPULATIONS OF COLORADO RIVER CUTTHROAT TROUT IN NORTHWEST COLORADO"

A COOPERATIVE WORK PLAN
INCLUDING
FOREST SERVICE,
BUREAU OF LAND MANAGEMENT, AND
COLORADO DIVISION OF WILDLIFE

1992

CONSERVATION PLAN FOR
COLORADO RIVER CUTTHROAT TROUT
IN NORTHWEST COLORADO

"TO PRESERVE EXISTING POPULATIONS OF
COLORADO RIVER CUTTHROAT TROUT
IN
NORTHWEST COLORADO"

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October 1992

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SUMMARY

This Conservation Plan details the first phase of a 2-phase conservation and reintroduction program to restore genetically pure Colorado River cutthroat trout (CRN) to as much of its historic range in northwest Colorado as practical. The two phases in this program are

1. Conservation--to preserve existing populations of pure CRN in northwest Colorado, and

2. Reintroduction--to expand the range of pure CRN in northwest Colorado.

Phase 1, which is described in this plan, includes the following activities:

1. Describe existing CRN populations and their instream/riparian habitats.

2. Construct in-channel barriers.

3. Improve existing watershed conditions.

4. Regulate angling and fish stocking.

5. Evaluate and monitor land management decisions.

6. Monitor physical and biological status and trends.

7. Improve instream habitat.

8. Survey waters with potential populations of CRN.

9. Implement interpretive and educational programs.

10. Acquire and maintain minimum instream flows.

Phase 2, which will be covered in a future plan, includes these activities:

1. Take spawn from genetically pure CRN and rear fish for reintroduction.

2. Develop list of potential reintroduction sites.

3. Secure reintroduction sites and remove competing non-native fish species.

4. Stock selected sites with genetically pure CRN.

5. Maintain source of genetically pure CRN eggs.

This plan guides field staff toward projects which best meet the overall goal of restoring genetically pure CRN to as much of its historic range in northwest Colorado as practical. Due to budgeting and planning differences, not all agencies will be participating on the same time schedule. In general, USFS and BLM will handle habitat related activities and associated NEPA requirements while CDOW will handle species management activities.

The CRN populations targeted in this plan are the self-sustaining populations in northwest Colorado which have been identified and ranked either "A", "B", or "C" in genetic purity using Binns's method. These populations are listed in Appendix A. Until DNA verification of the commonly used "A-F" purity ratings is complete, populations with an "A" rating will receive top priority.

SIGNATURE PAGE

The undersigned enter into this Conservation Plan to share the benefits derived by acting cooperatively to protect and enhance populations of Colorado River cutthroat trout in Northwest Colorado. This is not a financially or legally binding agreement.

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INTRODUCTION

Cutthroat trout, Oncorhynchus clarki, is the only species of trout native to Colorado and includes four subspecies: the Colorado River cutthroat trout (O. clarki pleuriticus); the greenback cutthroat trout (O. clarki stomias); the yellowfin cutthroat trout (O. clarki macdonaldi); and the Rio Grande cutthroat trout (O. clarki virginalis). During the past one hundred years, all four subspecies have been adversely affected by development of land and water resources and stocking of non-native salmonids in the Rocky Mountain region. Distribution of Colorado River cutthroat, greenback cutthroat and Rio Grande cutthroat trouts have been reduced to a fraction of their historic range. The yellowfin cutthroat trout is extinct (Behnke 1988). Additional background information on the Colorado River cutthroat trout (CRN) is in Appendix B.

The Colorado Division of Wildlife (CDOW) is responsible for management of CRN populations while the Bureau of Land Management (BLM) and US Forest Service (USFS) manage most of the public land habitat for this subspecies in northwest Colorado. Due to these interagency management responsibilities, the three agencies have agreed to work cooperatively toward the conservation and re-introduction of this subspecies.

In 1990, the CDOW's Northwest Regional Office designated the CRN as its top priority in management and planning for coldwater species in that region. In 1991, an interagency team of biologists from the CDOW, BLM, and USFS developed a plan to conserve existing populations of CRN and provide strategies to reintroduce this subspecies on federal lands within CDOW's northwest regional administrative boundaries (Wyoming on the north, Utah on the west, Mesa/Delta county line on the south, Continental Divide on the east).

The interagency team recommended separating the process into two phases. The first phase is outlined in this Conservation Plan, which will be in effect from 1992-1997. The goal of first phase work is to preserve existing populations of pure CRN in northwest Colorado. The plan contains specific guidelines for use by both federal and state agency field personnel to meet this goal. The goal of second phase work will be to expand the range of pure CRN in northwest Colorado. The second phase or Reintroduction Plan could begin any time the cooperating agencies are satisfied with progress on Phase one.

This timetable will provide both state and federal agencies time to build public consensus for implementing complex projects to remove non-native trout species, to acquire needed technical expertise in field staff positions, and to acquire genetically pure CRN for reintroduction.

DEFINITION OF TARGET POPULATIONS

The CRN populations targeted in this plan are the self-sustaining populations in northwest Colorado which have been identified and ranked either "A", "B", or "C" in genetic purity using Binns' morphometric method (Binns 1977). The names, locations and purity rankings of these populations are listed in Appendix A.

Since the time of those ratings, electrophoretic and DNA techniques have become available for assessing genetic purity, and the Binns rankings will be verified using these methods. Until this verification is complete (early 1993--CDOW contract with CSU), populations with an "A" ranking will be top priority, with the assumption that no populations which show hybridization with rainbow or other cutthroat subspecies will be used in reintroduction activities. However, the existing populations of "B-C" CRN will be maintained since these purity ratings may reflect genetic drift and not hybridization. These populations may also have other values we are not aware of.

1. Describe existing populations and their instream/riparian habitats.

Narrative: Fish community and habitat characteristics, and baseline population distribution, should be identified for watersheds where CRN populations occur. Population characteristics such as age class size and frequency, numbers of individuals per unit of area and the physical condition of individuals should be measured over a number of years to develop trend data. Baseline genetic information for each population should be also be collected. Biological monitoring programs will be designed with special emphasis on minimizing handling of fish. Information on habitat characteristics including instream flows, water quality and temperature, quantity and quality of overwintering habitat, stream bottom structure and associated entomology should be collected and evaluated. Riparian habitat should also be characterized using vegetative structure, species diversity, condition and trend as measurable components. CDOW, BLM, and USFS would be jointly responsible for collecting this information.

2. Construct in-channel barriers.

Narrative: In-channel barriers to fish movement will be planned and built by BLM and USFS if necessary to prevent movement of non-native fish species into CRN communities. It is important to prevent such movement to maintain the genetic integrity of CRN populations. CDOW will cost-share on these projects. Barriers may be temporary on streams where plans include eventual reclamation of the fisheries in the watershed. NEPA analysis will be done by the respective federal agency and the CDOW will monitor the effectiveness of the barriers.

3. Improve existing watershed conditions.

Narrative: Watersheds with existing populations of CRN will be identified in Forest Plans, grazing allotments and RMPs/AMPs, activity plans, and integrated resource plans. They will be surveyed and plans developed to mitigate existing conditions which cause adverse impacts to water quality, instream habitats, channel stability, riparian areas, and population survivability, etc. This can be accomplished by: 1) revising Allotment Management Plans to include protection and restoration of stream and riparian habitat; 2) upgrading or replacing existing culverts which prevent upstream fish passage during spawning and low flow periods; 3) road improvements including outsloping, construction of waterbars, etc.; 4) stabilizing eroding streambanks through riparian habitat enhancement; 5) developing and implementing of measures to mitigate impacts associated with old timber sales, recreation areas and mines; and 6) acquisition of private water rights to increase base stream flows.

4. Regulate angling and fish stocking.

Narrative: When and where necessary, existing populations of CRN will be protected by implementing special regulations such as stream closures, catch and release, and restrictions on the type of fishing tackle allowed. CDOW will prohibit stocking of species which could damage the aquatic ecosystems of the selected CRN waters. USFS and BLM will be consulted and will cooperate on regulation changes.

5. Evaluate and monitor land management decisions.

Narrative: All land management decisions made by BLM and USFS which could impact existing CRN populations and which will require NEPA documentation will include both pre- and post-project evaluation and monitoring to ensure that important habitats for this subspecies are protected. Timber management, road construction, mineral development, and their associated impacts should be analyzed and mitigated prior to implementation. In addition, impacts to existing populations should be evaluated in livestock grazing management planning, specifically focusing on riparian areas. Water diversions should be closely evaluated and monitored if adverse impacts to cutthroat habitat could result. The BLM and USFS would be primarily responsible for conducting these analyses.

6. Monitor physical and biological status and trends.

Narrative: Implementation of a long term monitoring program, using both biological and physical baseline data collected under Activity 1, will enable evaluation of trends within populations and watersheds (Appendix C). Biological and habitat parameters to be monitored will be jointly agreed to by representatives of the interagency team. Each agency will be responsible for developing their respective budgets to meet their responsibilities.

7. Improve instream habitat.

Narrative: Habitat improvement techniques can provide missing habitat components or improve existing ones. These techniques include instream structures to improve pool to riffle ratios, acquisition of water rights to enhance minimum stream flows, streambank stabilization, riparian management, etc. Design and location of enhancement projects will depend on evaluation of total watersheds and related aquatic ecosystems in addition to the critical habitat requirements of CRN, with special emphasis on securing stream flows. Habitat enhancement projects will be monitored after implementation to determine long term successes, failures, or necessary modifications. CDOW, BLM, and USFS will be responsible for implementation of this action through the development of Challenge/Cost-Share Agreements.

8. Survey waters with potential populations of CRN.

Narrative: Waters which are suspected of supporting CRN populations and have not been surveyed by CDOW will be inventoried to determine the presence or absence of CRN. If CRN are present, CDOW will assign a purity rating to each population and update the WRIS database. Interviews with field personnel, records maintained by the BLM, CDOW, and USFS, and other appropriate databases and individuals will be used as the source for this list. USFS and BLM will provide CDOW with a list of potential populations by May, 1993. CDOW will have primary responsibility for maintaining this list and conducting population inventories. BLM and USFS will assist the Division with inventories as requested.

9. Implement interpretive and educational programs.

Narrative: Public education is critical to the success of conservation and recovery efforts for CRN in northwest Colorado. Support of local angling groups and the general public will be needed to successfully implement complex reclamation efforts by public land management agencies. Potential linkages with CDOW's River Watch Program and Aquatic Project Wild will be explored to develop local programs which will allow schools to participate in the conservation of local CRN populations and the long-term protection of their watersheds (Appendix D).

10. Acquire and maintain minimum instream flows.

Narrative: Minimum instream flows are required to sustain existing CRN populations. The CDOW has and will continue to request that the Colorado Water Conservation Board file for instream flows that will protect all life stages of trout. In addition to water rights actions, federal agencies will condition special use permits to provide instream flows. Where possible, all streams containing CRN populations and all re-introduction waters will have an instream flow filing. Where filings already exist, they must provide adequate instream flow for all life stages of CRN.

BUDGET AND PLANNING RESPONSIBILITIES AND TIMELINES

CDOW (Fiscal Year X is July, Year X to July, Year X + 1)

I. July-August, State Fiscal Year X
   A. CDOW meets with USFS/BLM to evaluate potential cost-share projects for State Fiscal Year X + 2.
      1. CDOW:
         a. completes habitat and fish population evaluation.
         b. provides budget for State Fiscal Year X + 2.
      2. USFS/BLM:
         a. completes cost estimates.
   B. Evaluations in July-August 1992 will include projects for summer 1993 and summer 1994.

II. October, State Fiscal Year X
   A. CDOW selects projects it will schedule in State Fiscal Year X + 2.
      1. CDOW:
         a. notifies USFS/BLM of approved projects.
      2. USFS/BLM:
         a. complete NEPA requirements.

III. April, State Fiscal Year X
   A. USFS/BLM prepare collection agreements for projects approved in October, State Fiscal Year X - 1 and scheduled for State Fiscal Year X + 1.

USFS/BLM (FISCAL YEAR X is October, Year X - 1 to October, Year X)

I. July-August, Federal Fiscal Year X
   A. CDOW meets with USFS/BLM to evaluate potential cost-share projects for Federal Fiscal Year X + 2.
      1. CDOW:
         a. completes habitat and fish population evaluation.
         b. provides budget for Federal Fiscal Year X + 2.
      2. USFS/BLM:
         a. completes cost estimates.
   B. Evaluations in July-August 1992 will include projects for summer 1993 and summer 1994.

II. October, Federal Fiscal Year X + 1
   A. CDOW selects projects it will schedule in Federal Fiscal Year X + 2.
      1. CDOW:
         a. notifies USFS/BLM of approved projects.
      2. USFS/BLM:
         a. complete NEPA requirements.

III. April, Federal Fiscal Year X + 1
   A. USFS/BLM prepare collection agreements for projects approved in October, Federal Fiscal Year X and scheduled for Federal Fiscal Year X + 1.

APPENDICES

APPENDIX A1

LOCATIONS OF "A" RATED POPULATIONS OF CRN

The following populations of Colorado River cutthroat trout have a purity rating of "A" or most pure.

NO. AND NAME OF SITE	YEAR SAMPLED	RATING (PROBLEM*)	LOCATION
01 Abrams Creek	1980	A- (PC)	T5S, R84W, Sec. 05
02 Bobtail Creek	1985	A- (PC)	T3S, R76W, Sec. 28
03 Clinton Reservoir	1985	A- (SP)	T75, R79W, Sec. 23
04 Corral Creek	1984	A- (SP)	T6S, R79W, Sec. 22
05 East Meadow Creek	1982	A+	T4S, R81W, Sec. 03
Fawn Creek		A-	T9N, R90W, Sec. 19
06 French Gulch	1985	A- (SP)	T6S, R77W, Sec. 31
07 Fryingpan Lake 2 and 3	1984	A- (BT,SP)	T10S, R82W, Sec. 11
08 Hack Lake	1980	A (SP)	T3S, R87W, Sec. 03
09 Hahn Creek	1982	A- (SP)	T2N, R90W, Sec. 35
Hamilton Creek			
10 Hat Creek	1982	A+	T6S, R83W, Sec. 22
11 Little Vasquez Creek	1983	A+	T2S, R75W, Sec. 28
12 Lost Trail Creek	1982	A- (BT)	T11S, R88W, Sec. 25
13 Mitchell Creek	1984	A+	T6S, R89W, Sec. 06
14 North Little Green Creek	1985	A- (SP)	T4N, R82W, Sec. 07
15 Nickelson Creek	1982	A- (SP)	T9S, R86W, Sec. 30
16 Nolan Creek	1982	A (SP)	T6S, R83W, Sec. 16
17 North Fork Swan River	1985	A- (SP)	T6S, R77W, Sec. 24
18 Rocky Fork Creek	1986	A (SP)	T9S, R84W, Sec. 18
19 Snell Creek	1986	A- (SP)	T1N, R89W, Sec. 11
20 Steelman Creek	1985	A- (PC,SP)	T3S, R76W, Sec. 20
21 West Cross Creek	1982	A+	T7S, R82W, Sec. 01

*Problems which caused ratings below A+ are
S = Scales
PC= Pyloric caeca
BT= Basibranchial teeth
SP= Spotting pattern

APPENDIX A2

LOCATIONS OF "B" RATED POPULATIONS OF CRN

The following populations of Colorado River cutthroat trout have a purity rating of "B" or show slight signs of hybridization.

NO. AND NAME OF SITE	YEAR SAMPLED	RATING (PROBLEM*)	LOCATION
01 Arapahoe Creek	1981	B (SP)	T2N, R74W, Sec. 30
02 Avalanche Creek	1981	B (BT,SP)	T9S, R88W, Sec. 29
03 Berry Creek	1983	B (PC,BT,SP)	T5S, R82W, Sec. 05
04 Big Beaver Creek	1986	B (PC,SP)	T1S, R91W, Sec. 07
05 Butler Creek	1982	B+ (BT)	T4S, R92W, Sec. 24
06 Cataract Creek	1981	B+ (SP)	T7S, R79W, Sec. 19
07 Cattle Creek	1985	B (S,PC,SP)	T7S, R89W, Sec. 12
08 Columbine Creek	1981	B (PC,SP)	T3N, R75W, Sec. 29
09 Corral Creek	1983	B+ (S)	T3S, R90W, Sec. 30
10 Cross Creek	1985	B+ (PC,SP)	T5S, R81W, Sec. 36
11 Cunningham Creek	1984	B+ (BT)	T8S, R82W, Sec. 19
12 Difficult Creek	1981	B (SP)	T10S, R84W, Sec. 28
13 East Fork Parachute Creek	1983	B+ (BT,SP)	T5S, R96W, Sec. 36
14 East Fork Red Dirt Creek	1980	B- (BT)	T3S, R86W, Sec. 34
15 East Lake Creek	1984	B- (BT,SP)	T5S, R82W, Sec. 07
16 Express Creek	1981	B+ (SP)	T11S, R84W, Sec. 32
17 First Creek	1981	B- (BT)	T9N, R87W, Sec. 17
18 Indian Creek	1980	B+ (BT)	T4S, R81W, Sec. 29
19 Jack Creek	1978	B (S)	T10S, R83W, Sec. 25
20 JQS Gulch	1983	B+ (BT,SP)	T5S, R94N, Sec. 26
21 Lake 10794	1981	B+ (S)	
22 Lake Diana	1980	B (PC,BT)	T11N, R83W, Sec. 04
23 Lake of the Crags	1980	B- (BT)	T8N, R83W, Sec. 21
24 Little Skinny Fish Lake	1980	B (BT)	T1N, R87W, Sec. 19
25 Luna Lake	1980	B+ (SP)	T8N, R83W, Sec. 28
26 Mandall Creek	1980	B+ (S,SP)	T1N, R86W, Sec. 19
27 Meadow Creek	1985	B+ (SP)	T5S, R87W, Sec. 26
28 Miller Creek	1984	B- (BT,SP)	T5S, R79W, Sec. 29
29 North Fork Elliott Creek	1981	B (SP)	T2S, R80W, Sec. 33
30 North Thompson Creek	1981	B (BT,SP)	T8S, R88W, Sec. 31
31 Oliver Creek	1984	B- (BT,SP)	T11N, R87W, Sec. 23
32 Pitkin Creek	1980	B (SP)	T5S, R80W, Sec. 11
33 Polk Creek	1986	B+ (SP)	T5S, R79W, Sec. 28
34 Porcupine Lake	1980	B (S,BT)	T8S, R83W,
35 South Fork Ranch Creek	1984	B- (PC,SP)	T1S, R75W, Sec. 22
36 Spruce Creek	1981	B (BT)	T1S, R80W, Sec. 21
37 Ute Creek	1984	B+ (BT,SP)	T3S, R90W, Sec. 16
38 West Fork Red Dirt Creek	1980	B- (PC,BT)	T3S, R86W, Sec. 34

*Problems which caused ratings below A+ are

S = Scales
PC= Pyloric caeca
BT= Basibranchial teeth
SP= Spotting pattern

APPENDIX A3

LOCATIONS OF "C" RATED POPULATIONS OF CRN

The following populations of Colorado River cutthroat trout have a purity rating of "C" or show some hybridization.

NO. AND NAME OF SITE	YEAR SAMPLED	RATING (PROBLEM*)	LOCATION
01 Big Park Creek	1981	C (PC,BT)	T1N, R82W, Sec. 27
02 Black Gore Creek	1982	C (S,BT)	T5S, R79W, Sec. 18
03 Cabin Creek	1985	C (PC,BT,SP)	T1S, R75W, Sec. 09
04 Carter Lake	1980	C (BT)	T11S, R86W, Sec. 23
05 E. Middle Fork Parachute Creek	1981	C (S,BT)	T5S, R95W, Sec. 19
06 Hunter Creek	1984	C (BT,SP)	T9S, R86W, Sec. 27
07 Johnson Creek	1984	C+ (BT,SP)	T11N, R86W, Sec. 19
08 Lake Creek	1978	C (S,BT)	T11N, R86W,
09 Little Green Creek	1985	C- (BT,SP)	T4N, R83W, Sec. 14
10 Lost Creek	1982	C (BT,SP)	T1N, R90W, Sec. 15
11 Lost Dog Creek	1980	C (S,BT)	T10N, R84W, Sec. 26
12 McCoy Creek	1978	C (BT,SP)	T5S, R82W, Sec. 03
13 Middle Thompson Creek	1981	C+ (BT,SP)	T9S, R88W, Sec. 03
14 Miller Creek	1984	C- (BT,SP)	T8N, R86W, Sec. 28
15 Northwater Creek	1983	C (S,BT,SP)	T5S, R95W, Sec. 12
16 Poose Creek	1983	C+ (BT)	T3N, R88W, Sec. 22
17 Possum Creek	1980	C (PC,SP)	T5S, R90W, Sec. 24
18 Red Dirt Creek	1986	C (BT,SP)	T2N, R78W, Sec. 34
19 Roaring Fork Creek	1981	C (BT,SP)	T2N, R75W, Sec. 14
20 Sopris Creek	1985	C- (S,BT,SP)	T8S, R87W, Sec. 12
21 Trail Creek	1984	C+ (BT,SP)	T3N, R77W, Sec. 35
22 Trapper Creek	1983	C+ (BT,SP)	T5S, R95W, Sec. 12
23 Trapper's Lake	1987	C (BT,SP)	T1S, R88W, S.02 & 11
24 Yule Creek	1981	C+ (PC,BT)	T11S, R88W, Sec. 25

*Problems which caused ratings below A+ are
S = Scales
PC= Pyloric caeca
BT= Basibranchial teeth
SP= Spotting pattern

APPENDIX B

BACKGROUND INFORMATION ON

COLORADO RIVER CUTTHROAT TROUT

General Description

Oncorhyncus clarki pleuriticus was originally described by Cope (1872) from specimens taken from the Green River basin in Wyoming, the South Platte River in Colorado, and the Yellowstone River in Montana. In 1891, Jordan (1891) gave a more complete description of scale counts, spotting patterns and coloration and applied the name pleuriticus to those cutthroat trout inhabiting the Colorado River basin. The Colorado River cutthroat trout has since been described in more detail (Wernsman 1973; Behnke and Zarn 1976; Johnson 1976; Binns 1977; Behnke 1979; Behnke and Benson 1980). The body of O. clarki pleuriticus is described as yellow with a pale to brilliant red band which runs horizontally along both sides. During the spring spawning period, males often exhibit crimson coloration along the ventral region. The spotting pattern, consisting of large round black spots, is variable according to geographic locality. Spots are concentrated anteriorly above the lateral line and posteriorly. Typical specimens have 170-200 lateral series scales, 25-45 pyloric caecae, and 1-20 basibranchial teeth. Morphometric and meristic characteristics have been used along with electrophoretic and DNA techniques to determine the genetic purity of individual populations.

Historic and Present Distribution

Historic range of Colorado River cutthroat trout extended from the headwaters of the Colorado River basin downstream to the Dirty Devil River, Utah on the western boundary and the San Juan drainage of Colorado, New Mexico and Arizona on the eastern boundary. In Colorado, Wernsman (1973) reported only three populations of relatively pure O. clarki pleuriticus in tributaries to the main Colorado River. These included: Cunningham Creek, tributary to the Fryingpan River (Pitkin County); Northwater Creek, tributary to Parachute Creek (Garfield County); and the headwater area of the Colorado River in Rocky Mountain National Park (Grand County). From 1978 to 1987, the Division of Wildlife surveyed 135 streams and 25 lakes in northwestern Colorado (Martinez 1988). Selection of streams and lakes for the survey was based on computer inventory data listing waters known to contain cutthroat trout within the historic range of O. clarki pleuriticus. Waters to be surveyed were further stratified using historic stocking records. Waters previously stocked with rainbow trout were eliminated from the survey due to the high potential for hybridization.

However, all waters stocked with cutthroat trout, including nonnative cutthroat, were surveyed. Following Behnke (1976), survey efforts focused on isolated stream headwaters as these were considered the most likely location of pure O. clarki pleuriticus. Using purity grades established by Binns (1977), surveyed populations were assigned a grade from A (most pure) through F (least pure) to delineate degree of hybridization. Of the 160 waters surveyed by the Division of Wildlife during this nine year period, 21 populations rated A, 38 rated B, 24 rated C, 3 rated D, and 10 rated E. The locations of the A, B, and C populations are provided in Appendix A (Martinez 1988).

In 1984, CDOW sampled six of the A ranked populations for abundance and distribution. Only two of these populations had more than 12 fish longer than 15 centimeters TL per 100 meters of stream. Cutthroat trout distribution within the six A populations totaled 24 kilometers of which one-third occurred in one stream. Since 1986, no additional information on relative abundance, distribution or age class strength has been collected on "A", "B", and "C" rated populations identified by the CDOW survey.

Reasons for Decline

The distribution and abundance of CRN in northwest Colorado have been reduced due to alteration of habitat and introduction of non-native trout species. Habitat alterations include: adverse impacts to riparian vegetation and stream channel stability; water development with concomitant flow deletions during critical time periods; and water quality degradation due to extensive watershed damage. In addition, increased road access has resulted in more angling pressure on this highly susceptible trout subspecies.

The stocking of non-native trout species, which began in the late 1800's, is considered a primary cause of the decline of O. clarki pleuriticus in northwest Colorado. The synergistic effect of increases in non-native trout populations and altered habitat has adversely impacted CRN populations. The ability of O. clarki pleuriticus to hybridize with rainbow trout and other sub-species of non-native cutthroat trout and the effects of competition with brook trout are major factors in the decline of CRN in northwest Colorado.

General Life History

The life history and ecology of O. clarki pleuriticus is similar to that of other cutthroat trout species. Its ecological requirements are rather generalized and broad-based, allowing CRN to survive in a wide range of habitats. CRN are considered to be "hardier" and more resilient to habitat perturbations than other interior cutthroat subspecies. Population of O. c. pleuriticus have survived, and even prospered, under conditions that would have led to the extermination of other less resilient interior cutthroat trout subspecies (e.g., greenback cutthroat trout). One example cited to support its hardiness is the survival of several pure populations in marginal habitats that have been subjected to water diversions and heavy livestock use.

As with most inland forms of cutthroat trout, O. c. pleuriticus evolved in isolation from other trout species. This evolutionary isolation places pleuriticus at a competitive disadvantage, rendering it vulnerable to hybridization with rainbow trout and replacement by brook and brown trout. Therefore, the most critical habitat attribute required for the establishment of self-sustaining, pure populations of CRN is the absence of other trout species and cutthroat subspecies.

Habitat Preferences

Most waters currently supporting trout populations likely provide suitable habitat for CRN (Behnke and Zarn 1976). Although historically occurring in a wide range of habitats, CRN are better suited to life in small streams, beaver ponds, and lakes than in large rivers. Once present in both the mainstream of Colorado and Green Rivers, O. clarki pleuriticus populations in these large rivers were quickly displaced following the introduction of non-native trout (Martinez 1988). Most remaining populations occur in small headwater streams.

These streams typically feature cold, clear-running, well-oxygenated water, cobble-boulder-gravel substrates, a good balance of pools to riffles, pH ranging from 6 to 9, and fairly high (>4%) stream gradients (Binns 1977; Hickman and Raleigh 1982). Optimal lacustrine habitat is characterized by clear, cold, deep lakes that are typically oligotrophic (Hickman and Raleigh 1982).

The pattern of replacement of native CRN by non-native trout indicates that the native trout prefer and function best at lower temperatures than the other species. CRN probably cannot persist in waters where maximum temperatures consistently exceed 21-22 C (Martinez 1988). Streams lacking adequate natural pool habitat but harboring an active beaver population often provide ideal habitat. The limiting factor in many suitable streams is lack of overwintering habitat. The habitat preferences described above generally occur above 7,000 feet, which serves to restrict most CRN populations to higher elevations. The flexibility and general nature of their ecological requirements enable CRN reintroduction sites to have significantly different conditions than the site of the potential donor population.

Food Habits

Colorado River cutthroat trout are generalist, opportunistic feeders (Behnke and Zarn 1976). In small headwater streams, they usually consume a wide range of aquatic, and to a lesser extent, terrestrial invertebrates. Feeding is size-dependent, larger specimens occasionally feed on fish and become more piscivorous as their size increases.

Reproduction

Spawning activity in O. clarki pleuriticus is similar to other cutthroat subspecies. Spawning takes place from late spring to early summer, when water temperatures rise to about 7 C (Behnke and Zarn 1976). CRN are obligatory stream spawners, depositing fertilized ova in redds constructed in gravel substrate (Behnke and Zarn 1976). Lake populations migrate to both inlet and outlet streams to spawn. In small headwater streams, sexually mature Colorado River cutthroat may be only 6-8 inches in length and spawn only 100-200 eggs. Stream populations usually reach sexual maturity between the ages of 2 and 4 (Martinez 1988). Colorado River cutthroat trout in Trappers Lake typically do not spawn until their fourth year of life (Drummond and Colborn 1965; Drummond 1966).

Size

Historically, the larger pleuriticus subspecies was more highly sought after than the smaller greenback cutthroat trout (O. clarki stomias) occupying the eastern slope of the Rocky Mountains. Anglers seeking to catch large trout would trek to the west slope of the Rockies, where CRN were reputed to reach sizes of 20 pounds or more. Remaining populations in small streams seldom exceed 12-16 inches, but large specimens are still occasionally taken from lake populations, demonstrating the growth potential of the pleuriticus subspecies.

Susceptibility to Angling

CRN are readily caught by anglers. Their high susceptibility to angling limits population size and rates of recovery in streams that are accessible to the public. In high access areas, special regulations (i.e., catch and release, flies and lures only, etc.) will be necessary to prevent overexploitation.

APPENDIX C

MONITORING GUIDELINES

Introduction

Success of the Colorado River cutthroat trout conservation effort will be largely dependent on the ability of resource agencies to implement management activities as planned, evaluate their effectiveness, validate information and assumptions used in making management decisions, and adapt future management accordingly. Monitoring is one of the most important steps in this adaptive management process. This plan addresses three general areas which should be considered in monitoring efforts.

Wildlife monitoring involves repeated measurement of habitat and population variables to assess change in capability of the habitat to support a species. Because of the dynamic nature of fish populations and the large number of variables which may affect fish abundance and population viability, monitoring efforts can become very involved and complex. However, it is not practical or necessary to monitor all resources and activities known to potentially influence CRN.

Site-specific conditions and resource issues should determine what type of monitoring is appropriate for a given situation. In other words, the right questions need to be asked before developing a monitoring plan. It then becomes a matter of establishing and prioritizing objectives, identifying types and levels of data needed, determining study design and data analysis, and identifying resources needed to carry out the monitoring effort. It is not the intent of this plan to provide a "cookbook" for monitoring CRN populations, but rather to assist field biologists in developing monitoring plans which address site-specific conditions.

Biological Monitoring

Populations of CRN are small and will not be subjected to repeated intensive sampling. Information needed to manage these populations is distribution within a stream, presence of reproduction, presence of other fish species, genetic purity of the population and an estimate of population size. Waters containing CRN populations need not be surveyed more than once every 5 years unless major physical changes have occurred. Since these populations have existed for many years it can be assumed the habitat is minimally suitable to continue to support that population. If there are no other salmonids present to create a hybridization problem the genetic purity of that population will be considered secure even though genetic drift may occur.

An initial inventory will be conducted to establish a baseline for distribution and year class success. Distribution will be recorded in CDOW's WRIS system. Year class success will be determined by length frequency distribution. Three separate year classes will indicate a healthy population. In the event only one year class is present, the land management agency and the CDOW will determine if any immediate remedial action is necessary or possible.

Each population will have 5 fish analyzed to establish the DNA profile, using a protocol described by Don Proebstel, CSU Larval Fish Lab. A combination of meristic and DNA analysis will be used to establish a population's genetic purity rating. No additional genetic work will be conducted unless all agencies agree it is needed. If competing species are present, their distribution will also be mapped in WRIS so that changes over time can be determined. Forms and instructions for sampling are available from CDOW, Grand Junction, Colorado.

Physical Habitat Monitoring

The physical habitat of streams that presently contain Colorado River cutthroat trout and streams identified as potential reintroduction sites need to be inventoried and subsequently monitored. Biological inventories will identify streams that harbor populations of A, B, or C purity Colorado River cutthroat trout. Streams containing pure (A,B, or C) populations will be intensively inventoried using the Basin-wide Stream Habitat Inventory, described below.

Streams identified as potential reintroduction sites will undergo an initial habitat inventory to determine factors that may limit population size or productivity. The CDOW Trout Stream Inventory (TSI-form attached) offers a rapid method of evaluating physical habitat. Each agency will complete the in-stream habitat, channel characteristics, and riparian vegetation sections of the TSI. The score obtained for these three sections will provide an estimate of the quality of the physical habitat in potential reintroduction streams. The TSI will allow all potential reintroduction sites to be compared on an equal basis. Streams that score well for physical habitat will be listed as suitable reintroduction sites. Streams that do not score well will be evaluated on a case-by-case basis to determine if their physical habitat limitations prevent them from sustaining a population of Colorado River cutthroat trout or the feasibility of modifying habitat to meet minimum standards. There are no formal habitat criteria for evaluating lakes.

Following the initial habitat evaluation, those streams determined to be suitable reintroduction sites will be combined with the known A, B, and C purity streams and all will be inventoried using the Basin-wide Stream Habitat Inventory (Basin-wide method). The Basin-wide method was developed as a fairly quick inventory approach that fully describes those habitat conditions important to fish. Basin-wide habitat inventories will be conducted by 2-person crews consisting of an estimator and a recorder. Two person crews should average about 1.0-1.5 miles of stream habitat inventory per day. Prior to the start of each field season, those streams that have met the initial physical habitat reintroduction criteria and streams known to contain pure populations of Colorado River cutthroat trout will be placed on the list of streams to be inventoried by the Basin-wide method crew. If stream miles in need of Basin-wide inventory exceed the number of miles that the crew can complete during the field season, the agency fisheries biologist will prioritize the stream inventories to be completed that year. Following the initial Basin-wide inventory on a given stream, subsequent inventories will be repeated every 3-6 years to allow for early detection of changes in stream habitat.

Programs are available that allow Basin-wide inventory data to be entered directly into a Lotus 123 spreadsheet for statistical analysis. The Basin-wide method tracks changes in physical habitat variables from one inventory to the next and allows the user to determine if the changes are statistically significant. Detailed instructions and required data forms for using the Basin-wide method are available from the Medicine Bow National Forest Fisheries management Staff.

Water Quality and Quantity Monitoring

Monitoring water quality and quantity is not a routine procedure. Water quality is the product of several variables which interact in different ways to affect aquatic ecosystems. Water quality variables which are especially important to CRN communities are sediment, temperature, heavy metals and pH. Water should be nearly free of sediment during the entire year, maximum temperatures should not exceed 12-14 C, heavy metal pollution should be absent, and pH should range between 6.5 - 9.0. Management activities should be planned to maintain these attributes at appropriate levels, and to improve them to these levels in degraded habitats. Water quality sampling should follow standard methods.

Land management activities can also alter both the amount and timing of streamflow and both should be considered carefully in management decisions. There are several methods for establishing minimum bypass flows and channel maintenance flows, and these should be fully explored in an effort to obtain flows which will support CRN communities. Where minimum flows have been established monitoring efforts should concentrate on compliance and identifying whether the established flows are adequate to maintain habitat at the necessary level.

APPENDIX D

INTERPRETIVE AND EDUCATIONAL PROGRAMS

Introduction

Public education is critical in establishing support for the conservation of existing Colorado River cutthroat trout populations and future reintroduction programs in northwest Colorado. Education of the public sector can be achieved on various levels, from interpretive signing at heavily used recreation areas to developing programs for local schools. Information presented in this Appendix can be used to determine what types of public education may be applicable to Colorado River cutthroat trout to help derive conservation strategies for this subspecies. A short summary describing each type of program is provided.

Interpretive Programs

Projects and actions implemented on CRN waters on federal lands in northwest Colorado during the next five years may be enhanced by including an interpretive program element during planning efforts. Types of actions/projects which might benefit from interpretive programs include: angling regulation changes; construction of instream barriers; erosion control on existing roads; replacement of instream culverts; revegetation of riparian areas; AMP revisions; and general mitigation and monitoring of land management decisions (range, timber, recreation, minerals, etc.). Once an action is taken or project implemented, an interpretive signing program may be designed to educate the public about how the action/project meets agency conservation and recovery goals for this subspecies.

Sources and partners for funding interpretive programs include: Challenge-Cost-Share; Watchable Wildlife with potential integration with traditional wildlife projects; Trout Unlimited and Sportfish Institute (grants are available for education); internal Forest Service partnerships with recreation and wildlife programs; Special Congressional Funds (CIP, American Great Outdoor Initiative, "Bring Back the Natives", etc.); and non-traditional partners such as local environmental groups, citizen groups, etc.

Adopt-A-Stream/Watershed Program

This program can be developed on two levels to achieve desired objectives on an existing Colorado River cutthroat stream/watershed. The first level involves obtaining assistance local Trout Unlimited chapters or volunteers to implement projects and assume partial responsibility for follow-up monitoring needs. The second level is to focus on integrating local science curriculum in schools with conservation objectives for individual cutthroat streams. Development of a program at each or both of these levels centers on the concept of the public "adopting" a stream or watershed and establishes public ownership in maintaining a "healthy" system.

Level I: Project Implementation and Monitoring

Consider obtaining assistance of local volunteers from Trout Unlimited Chapters, outfitters and guides, construction companies, environmental groups, etc. for obtaining supplies and implementing projects (construction of barriers, instream habitat enhancement, trash clean-up, riparian revegetation, road reconstruction, construction of pasture fences on grazing allotments, etc.). Follow-up monitoring can be accomplished by requesting that an organized group (TU, Sierra Club, etc.) assume responsibility for obtaining volunteers to monitor various

parameters to determine success of conservation objectives for an individual stream/watershed. Monitoring may range from a simple reconnaissance of the stream/watershed with an annual written report to taking detailed instream channel measurements (residual pool depth, identification of cutthroat spawning areas, pool-riffle ratios, etc.) at permanent transect locations.

This type of program has been organized and has been successful in Oregon, California, and Washington. Contacts for further information are

Oregon:

Oregon Dept. of Fish and Wildlife
Adopt-A-River Program Att: Judy Siddon
5286 Table Rock Road
Central Point, OR 97502
(503) 776-6170

California:

Adopt-A-Watershed Program
P.O. Box 70
Hayfork, CA 96041
(926) 638-5294 or 4608

Copies of an 8-minute video describing an "Adopt-A-Watershed" program are available on a free 2-week loan basis from
Trinity County Resource Conservation District
P.O. Box 1414
Weaverville, CA 96093

Washington:

Adopt-A-Stream Foundation
P.O. Box 5558
Everett, WA 98201

This Foundation is a non-profit, tax-deductible Corporation led by a volunteer Board of Directors. The long-term goal of this Foundation is to have every stream in the Northwest adopted by schools, community groups, sports clubs, civic organizations and/or individuals.

Level II: Primary and Secondary School Program

Development of an educational program for children through the local school system can be valuable tool for obtaining public support for both conservation and reintroduction activities. The goal of this type of program is to help students develop a land ethic, a sense of stewardship toward their environment and community, and provide them with the skills to make educated, informed choices regarding wise resource management.

Education programs can be simple or complex. An example of a relatively simple program that has been highly successful on the west coast consists of purchasing and setting up aquaria in classrooms (funded through Trout Unlimited and state Fish and Game Agency); obtaining fry from the state hatchery through the local Fish and Game biologist; rearing these fry to a larger size and releasing them into a local stream (on federal land). At this time the class is given a streamside ecology lesson taught by representatives from the participating federal and state agencies. The class then "adopts" this stream and participates through written input on proposed land management decisions.

In the more complex program, kindergarten students adopt a stream/watershed and follow it as a focal point of their science curriculum through the twelfth grade (or freshman through senior level). In this way the stream/watershed becomes a living laboratory in which students participate in hands-on activities making science directly applicable and relevant to their lives. In addition, this type of program provides a thread that ties the entire K-12 science curriculum together and integrates many diverse subjects in science education.

For more information and copies of existing curricula please contact:

Colorado:

River Watch Program ATT: Barbara Horn
Aquatic Project Wild ATT: Carol Bylsma
Colorado Division of Wildlife
6060 Broadway
Denver, CO 80216
(303) 297-1192

California:

Adopt-A-Watershed Program
P.O. Box 70
Hayfork, CA 96041
(916) 628-5294 or 4608

The educational component of this program is presently being developed. Two units are being developed for each grade, K-12, and all teachers within the Trinity River basin will be trained in the use of this curriculum. This curriculum will be available in the Fall of 1992.

Washington:

Adopt-A-Stream Program
Publication: "Adopting A Stream: A Northwest Handbook"
by Steve Yates, 1988.
Published by the Adopt-A-Stream Foundation
Distributed by Univ. of Washing Press, Seattle.
Contact Washington State Dept. of Ecology or State Dep't of Fisheries.

An excellent handbook that covers the following curriculum topics: the Physical Environment of Streams; fishes; Aquatic Insects; Stream Ecology; Other Stream Animals; the Watershed; Adopted Streams (some examples); Adopting a Stream; Adopt_A-Stream Projects; Public and Community Education; Agencies and Organizations. Appendices include: Legislation (summaries); Stream Monitoring Techniques; Field Data Forms.

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AMMENDMENT

CONSERVATION PLAN FOR COLORADO RIVER CUTTHROAT TROUT IN NORTHWEST COLORADO

ROUTT NATIONAL FOREST

Introduction:

The monitoring of fisheries habitat requires repeated measurements of quantifiable data. Because monitoring entails chronic responsibilities and costs, the objectives of a monitoring plan must be clearly defined for each specific situation. An error just as serious as not collecting any data is that of collecting unnecessary or unmeaningful data. Changes in monitoring strategies and examples of the types of monitoring data that may be collected are presented below.

BIOLOGICAL MONITORING

The biological monitoring section of the plan, as exists, is adequate to monitor existing populations of CRN. The Routt National Forest would like to augment this section by extending biological monitoring efforts, where appropriate, to include data on potential prey of CRN, including non-game fish and macroinvertebrates. Examples of some of the methods available are the Biotic Condition Index (BCI), and T-WALK. In addition, we will map distribution of CRN and other fish species in a GIS system.

PHYSICAL HABITAT, WATER QUALITY AND WATER QUANTITY MONITORING

Existing Stream Populations of CRN:

1. CDOW TROUT STREAM INVENTORY (TSI). A rapid method of evaluating physical habitat. The TSI is not quantitative and is not necessarily repeatable. The TSI form will not be able to detect subtle differences in habitat quality among reaches of the same or different streams. A manual that defined terms and protocol for the inventory was not provided.

2. CDOW LAKES AND STREAMS DATABASES. This existing database is a usefull tool to describe the existing condition of the resource. Parts of the database correspond well with information included in GAWS (described below).

2. REGION 2 GENERAL AQUATIC WILDLIFE SYSTEM (GAWS). The level of inventory can be determined based on data needs and available funds and labor.

A. GAWS LEVEL I. IDENTIFICATION LEVEL. The objectives of a Level 1 GAWS survey are: to provide basic information for planning and generation of statistical data on a geographic scale, to aid in planning for more intensive surveys, and to provide a nucleus for accumulation of additional data. This Level has been completed for all stream courses appearing on topographic maps on the Routt National Forest.

B. GAWS LEVEL II. REACH IDENTIFICATION LEVEL. This level of survey divides streams into reaches with consistent channel types for prioritizing more intensive surveys. This survey provides baseline information on fisheries potential, data for response to issues of local and State concern, and to identify conditions or activities that may limit fisheries productivity.

C. GAWS LEVEL III. PRESCRIPTIVE PLANNING LEVEL. This level of survey uses a series of transects to measure habitat parameters and is intended for use where non-natural alteration of aquatic habitats is anticipated. This information can be used to make land management recommendations, or to establish permanent monitoring transects. The Routt National Forest has Level III information on a number of streams and is in the process entering the data on a personal computer.

D. GAWS LEVEL IV. IMPLEMENTATION/MONITORING/EVALUATION LEVEL. This level of survey is an extension of Level III and includes multiple transect measurements as well as other surveys to address specific problems such as fish populations, sediment, water quality, riparian conditions, channel stability, and productivity. Several acceptable tools are available for this intensive survey, and should be employed as appropriate, with the understanding that all the tools have limitations and must be tempered with professional judgement.

1. BASINWIDE fish habitat inventory.
2. Water Resources Research Institute (WRRI) Trout Cover Rating Method.
3. COWFISH (livestock/riparian conditions).
4. Pfankuch channel stability evaluation.
5. Habitat Quality Index (HQI).
6. R-2 CROSS (instream flows).
7. Instream Flow Incremental Methodology (IFIM - instream flows).
8. Biotic Condition Index (BCI - macroinvertebrates).
9. T-WALK (R2 Forest Service - macroinvertebrates and substrate).

Potential Reintroduction Sites for CRN:

Waters should be evaluated using the same procedure outlined for the existing populations. High mountain lakes with adequate spawning potential in outlets or inlets may provide excellent opportunities for reintroduction. If the potential habitat compares favorably to the known habitats, the manager should further evaluate the stream as a reintroduction site to include:

1. Existing barriers to fish migration
2. Potential to install barriers if none exist.
3. Security of the waters from potential over-harvest or accidental stocking of competetive species or less pure strains.
4. Ability to alter existing or proposed land management activities to maintain or enhance habitat for CRN.
5. Ability to remove competition by other fish species, and to prevent hybridization.